













Unit Testing / Module Testing with TBrun

Overview

TBrun[®] provides a fully automated unit test solution that enables developers and testers to apply the powerful static code analysis results of the LDRA tool suite to empower the unit level process.

TBrun makes use of the comprehensive control/data flow analysis provided by LDRA Testbed®. The information extracted includes details concerning the unit interface, parameters, globals (input and output), return values, variable types and usage and procedure calls.

Traditionally this level of information could only have been specified by a developer with an expert knowledge of the unit under test. Hence, in automating this process, TBrun frees up highly qualified staff who may then be re-assigned to other modeling, design and development tasks.

TBrun facilitates several test scenarios:

- Single procedures, Functions, Methods (Unit Test)
- Files containing many functions, Classes (Module Test)
- Complete programs (Sub System & System test) •

LDRA has revolutionised the traditional "unit testing" activity, which is typically performed on the host and/or target systems, with its new testing capability, eXtreme Testing.

Key Features

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The key benefit of LDRA's unit testing process, provided by TBrun, is the high degree of automation that the LDRA tool suite provides. This saves both time and resources, thereby enabling a quicker time to market.

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Unit Testing Embedded Systems with TBrun[®]

TBrun supports the creation of test cases and execution of them in multiple environments, namely:

- Host / Host
- Host / Target
- Host / Simulator

LDRA's Unit Testing Features:

- Automated test driver / harness generation with no manual scripting requirement
- High levels of test throughput may be achieved via the intuitive graphical and command line interface options
- Sophisticated automated analysis facilities which reduce test effort, freeing up developers and empowering testers
- Test data and test results are stored and maintained for fully automated regression analysis
- Automated detection and documentation of source code changes
- Tool driven test vector generation
- Facilitates execution of tests in host, target and simulator environments
- Automatically generated test case documentation including pass/fail and regression analysis reports

Host / Target Options

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Edt ... ue Cancel

Host / Target Execution History Host / Target Data File \$(Topfile)

TBrun generates seperate output files for the new and existing test cases in addition to any execution history files.

Host / Target systems may be restricted in the number of output channels available. The above two output files may be combined so that only one output file is produced.

Placement of the top file is dependant on shlayout.dat and / or the user's test execution environment. Use the combo box below to inform TBrun of the location of the file.

Enable use of single host / target output file		
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Suppress Output to Log Window via stdout

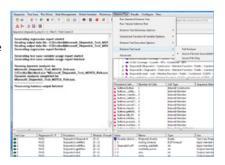
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TBrun Features

TBrun enables genuine and full automatic creation of the driver program. The automatically generated driver handles all language features automatically. Some of these scenarios are detailed below:

eXtreme Testing

eXtreme Testing is a totally automated solution which ensures that most source code behaviour can be quickly and easily exercised simultaneously recording high levels of code coverage. Consequently, eXtreme Testing automates the unit/ module/integration testing processes, including test harness and test vector production and eliminates the traditional time and resource problems associated with bottom-up testing.



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Automatically Generated Driver Program/Test Harness

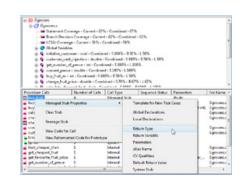
TBrun utilises sophisticated control flow and data flow analysis techniques to document the interface to the unit under test in full. This level of information then enables TBrun to automatically generate test drivers removing the need for manual scripting.

There are no limitations to the automatically generated driver. It is pure C/C++ & Ada $8_3/9_5$ (based on the application code) and can be executed on the host or in the target environment.

Stub Creation

Stubs can be generated from a single button click. The stub features include return values, check values and messaging hit counts which can be added via the graphical input negating the need for coding.

Stubs can be used for functions, methods, constructors, system calls, packages, generics etc.



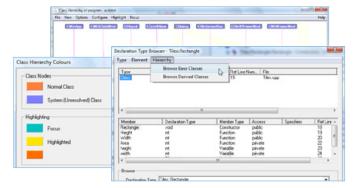
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Structures / Arrays / Unions

TBrun has the ability to be able to expose structure elements required for testing. By specifying values TBrun is able to populate test data.

Class Handling

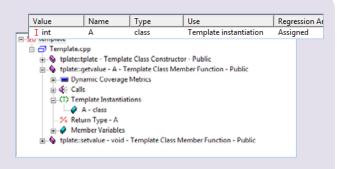
Automatic detection of class hierarchy, TBrun hand holds users through testing classes and creating instances. Tests can be written for a base class and be automatically applied to derived classes.



TBrun Features

Automatic Resolution of Templated Types

TBrun allows the full testing and stubbing of template classes. As part of this process the user initially defines the type(s) for the templated arguments when creating an object of a templated class. Then when testing the methods, the template types will automatically be substituted for the required type. Attributes, parameters and return variables that take their declaration types from template arguments can be initialised and tested within a test case. Member templates may be tested in the same fashion.





Exception Handling

Exceptions can be automatically caught and test cases can be passed or failed on their generation.

Pointer Handling

TBrun detects the use of pointers. The automatically generated driver program will enable the capturing of pointer values for testing, as well as input pointer wizards.

Additional functionality includes type expansion and linked lists.

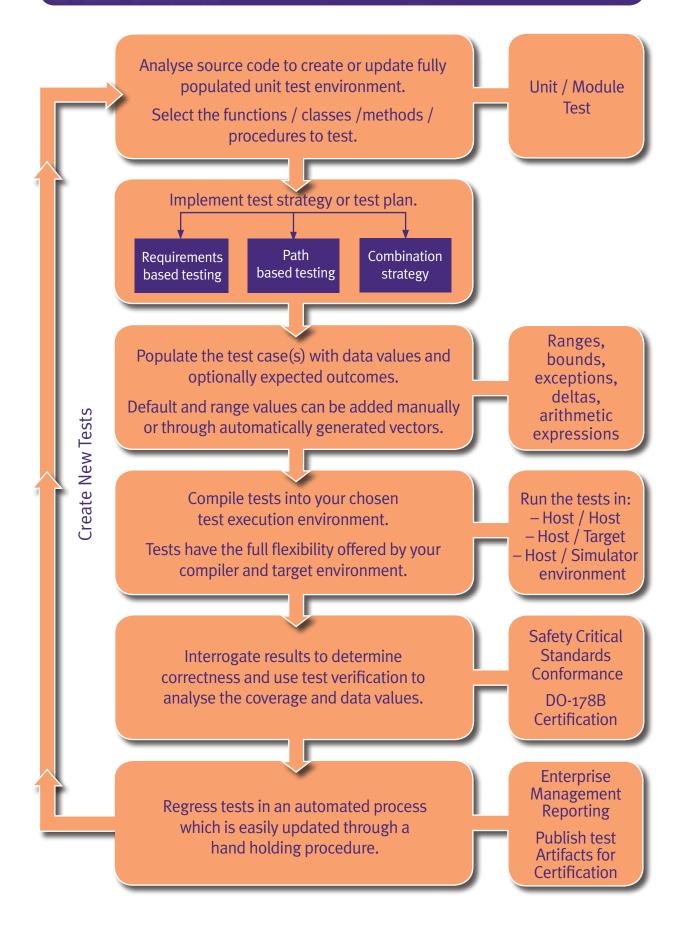
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Additional Automatically Handled Language Features:

- Abstract Class Testing
- Automatic Creation of Compound
- Objects in Test
- Access to Private Data
- Re-use of Tests through Class Hierarchy
- Polymorphism Handling
- Inheritance Handling
- Template Handling

- Automatic Creation & Object "Re-Use" (Through Attachment)
- Access Methods & Attributes through the Entire Hierarchy
- Exception Handling
- Pointer Handling
- Generics (Ada)
- In / Out Parameters (Ada)
- Records (Ada)

LDRA's Automated Unit Testing Process with TBrun



Client Testimonials

QinetiQ Vectored-thrust Aircraft Advanced Control (VAAC) Harrier



⁶LDRA is becoming so popular here that once software engineers have used the tools they are insisting they need to have it available at all times.⁹

Gary Sheppard, Senior Software Engineer, QinetiQ's Avionic Systems Integration Group (ASIC)

Neptec's Laser Camera System in use on Space Shuttle



⁶The tools reporting facilities for audit purposes are excellent. The team have also been able to dramatically increase the throughput of unit testing and as a result deliver the project on time.⁹

John Schneider, Director of Engineering, Neptec

TBrun Availability

TBrun is available for the following:

Languages

Ada 83 Ada 95 C C++ Host Platforms

Windows 9x/NT/2000/XP/Vista Unix Linux

Target Processors

ARM MIPS Freescale PowerPC Infineon Renesas Intel TI

Other languages, host platforms and target processors are available. Please contact LDRA for more information.



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LDRA Technology Inc. USA



Lexus LS460 with world's first motor-driven electric variable valve timing control system developed by Denso



⁶LDRA has the ability to work with Limited Target HW which is important in the automotive sector in order to meet the demands for cost reduction and downsizing. We use the LDRA tool suite as a benchmark for other third-party and similar software platform products.⁹ Akihito Iwai, Project Manager, DENSO Japan



⁶LDRA has proven they will support us in any way to get the job done especially in meeting demanding milestones. They provided outstanding support for several F-35 teammates: Lockheed Martin (Fort Worth), BAE (Wharton), Northrop Grumman (El Segundo), Seaweed, and Honeywell which directly contributed to a successful first flight of the AA-1 aircraft. We continue to work closely with LDRA to develop the needed automated process support to ensure that our software meets program cost, schedule, and quality targets.⁹